



LETTERS

edited by Etta Kavanagh

Retraction

WE WISH TO RETRACT OUR RESEARCH ARTICLE “STRUCTURE OF MsbA from *E. coli*: A homolog of the multidrug resistance ATP binding cassette (ABC) transporters” and both of our Reports “Structure of the ABC transporter MsbA in complex with ADP·vanadate and lipopolysaccharide” and “X-ray structure of the EmrE multidrug transporter in complex with a substrate” (1–3).

The recently reported structure of Sav1866 (4) indicated that our MsbA structures (1, 2, 5) were incorrect in both the hand of the structure and the topology. Thus, our biological interpretations based on these inverted models for MsbA are invalid.

An in-house data reduction program introduced a change in sign for anomalous differences. This program, which was not part of a conventional data processing package, converted the anomalous pairs (I+ and I–) to (F– and F+), thereby introducing a sign change. As the diffraction data collected for each set of MsbA crystals and for the EmrE crystals were processed with the same program, the structures reported in (1–3, 5, 6) had the wrong hand.

The error in the topology of the original MsbA structure was a consequence of the low resolution of the data as well as breaks in the elec-

tron density for the connecting loop regions. Unfortunately, the use of the multicopy refinement procedure still allowed us to obtain reasonable refinement values for the wrong structures.

The Protein Data Bank (PDB) files 1JSQ, 1PF4, and 1Z2R for MsbA and 1S7B and 2F2M for EmrE have been moved to the archive of obsolete PDB entries. The MsbA and EmrE structures will be recalculated from the original data using the proper sign for the anomalous differences, and the new C α coordinates and structure factors will be deposited.

We very sincerely regret the confusion that these papers have caused and, in particular, subsequent research efforts that were unproductive as a result of our original findings.

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References

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3. O. Pornillos, Y.-J. Chen, A. P. Chen, G. Chang, *Science* **310**, 1950 (2005).
4. R. J. Dawson, K. P. Locher, *Nature* **443**, 180 (2006).
5. G. Chang, *J. Mol. Biol.* **330**, 419 (2003).
6. C. Ma, G. Chang, *Proc. Natl. Acad. Sci. U.S.A.* **101**, 2852 (2004).

Aquaculture in Offshore Zones

THE EDITORIAL BY ROSAMOND NAYLOR, “Offshore aquaculture legislation” (8 Sept., p. 1363), suggests that the motivation for moving aquaculture into the open ocean is that “marine fish farming near the shore is limited by state regulations.” Although unworkable regulations may exist in a few states, in the larger scheme this is irrelevant. Of the offshore aquaculture projects currently under way, none are occurring in the U.S. Exclusive Economic Zone (EEZ); rather, they are happening in state waters. Even historically, only two aquaculture projects have ever occurred in federal waters (1).

Much of Naylor’s stated concern over offshore aquaculture is based on historical experience with near-shore fish farms. This is in spite of years of more relevant offshore

operations that reveal little, if any, negative impact on the environment or local ecosystems (2, 3). Naylor criticizes the National Offshore Aquaculture Act of 2005 because it lacks specific environmental standards. Yet, she recommends California’s recent Sustainable Oceans Act as a legislative model, although it is similarly silent, leaving those details to rule-making in response to the best available science.

Naylor criticizes the use of fishmeal as an aquaculture ingredient, ignoring the fact that industrial fisheries are well managed and would occur with or without aquaculture’s demand. Naylor ignores the higher efficiency of using fishmeal to feed fish compared with its use in land-based livestock operations (4). Also ignored is the inefficiency of using small pelagic fish in the natural setting to feed predator fish (5).

Researchers and entrepreneurs currently developing the technologies needed for offshore aquaculture share a vision of a well-managed

industry governed by regulations with a rational basis in the ecology of the oceans and the economic realities of the marketplace.

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References and Notes

1. The SeaStead project a decade ago, four miles off Massachusetts (see www.nmfs.noaa.gov/mb/sk/saltonstallken/enhancement.htm) and the recent Offshore Aquaculture Consortium experimental cage operation 22 miles off Mississippi (see www.masgc.org/oac/).
2. See www.lib.noaa.gov/docaqua/reports_noaa/research/hooarrprept.html.
3. See www.blackpearlsinc.com/PDF/hoarpi.pdf.
4. See www.salmonoftheamericas.com/env_food.html.
5. D. Pauly, V. Christensen, *Nature* **374**, 255 (2002).

IN HER PROVOCATIVE EDITORIAL “OFFSHORE aquaculture legislation” (8 Sept., p. 1363), R. Naylor raises valid points regarding regulation of oceanic aquaculture, since it is sure to grow in the future because of dwindling global fishery supplies. This growth is